



General

Guideline Title

ACR Appropriateness Criteria® radiologic management of gastric varices.

Bibliographic Source(s)

Saad, WEA, Al-Osaimi AM, Caldwell S, Ray CE Jr, Lorenz JM, Burke CT, Darcy MD, Fidelman N, Greene FL, Hohenwarter EJ, Kinney TB, Kolbeck KJ, Kostselic JK, Kouri BE, Nair AV, Rochon PJ, Rockey DC, Vatakencherry G, Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of gastric varices. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 8 p. [84 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Radiologic Management of Gastric Varices

Variant 1: Cirrhotic patient with active bleeding from large gastric varices exhibiting high flow by endoscopic Doppler ultrasound and a history of a wedge pressure of 20 mm Hg and a MELD score of 14. Three-phase contrast-enhanced CT demonstrates a large gastrosplenic shunt.

Treatment/Procedure	Rating	Comments
TIPS	8	
BRTO	7	
Endoscopic management (sclerosis or cyanoacrylate injection)	5	

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Cirrhotic patient with an index bleed from large gastric varices exhibiting high flow by endoscopic Doppler ultrasound with a MELD score of 20. Three-phase contrast-enhanced CT demonstrates a large gastroduodenal shunt.

Treatment/Procedure	Rating	Comments
TIPS	5	
BRTO	8	
Endoscopic management (sclerosis or cyanoacrylate injection)	5	
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Cirrhotic patient with small gastric variceal bleeding exhibiting slow flow by Doppler ultrasound and moderate ascites with a MELD score of 18. Contrast-enhanced MRI does not demonstrate a gastroduodenal shunt.

Treatment/Procedure	Rating	Comments
TIPS	8	
BRTO	4	
Endoscopic management (sclerosis or cyanoacrylate injection)	7	
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Cirrhotic patient with large gastric varices exhibiting high flow by endoscopic Doppler ultrasound and a significant history of hepatic encephalopathy with a MELD score of 18. Contrast-enhanced MRI demonstrates a large gastroduodenal shunt.

Treatment/Procedure	Rating	Comments
TIPS	4	
BRTO	8	
Endoscopic management (sclerosis or cyanoacrylate injection)	6	
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Cirrhotic patient with esophageal and gastric variceal bleeding (gastric varices considered high risk for endoscopic management/failed endoscopic management) with a MELD score of 13 and a history of hepatic wedge pressure of 22 mm Hg. Three-phase contrast-enhanced CT demonstrates a small gastroduodenal shunt.

Treatment/Procedure	Rating	Comments
TIPS	8	
BRTO	5	
Endoscopic management (sclerosis or cyanoacrylate injection)	5	

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate
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Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Cirrhotic patient with gastric variceal bleeding large gastric varices exhibiting high flow by endoscopic Doppler ultrasound with a MELD score of 12 and a history of a hepatic wedge pressure of 10 mm Hg. Contrast-enhanced MRI demonstrates a large gastroduodenal shunt.

Treatment/Procedure	Rating	Comments
TIPS	5	
BRTO	8	
Endoscopic management (sclerosis or cyanoacrylate injection)	6	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Bleeding from gastric varices (GVs) is usually more severe and is associated with higher morbidity, transfusion requirements, and mortality compared to bleeding from esophageal varices (EVs). The approach to prevention of first bleed and rebleed from GV has remained empirical in the absence of large randomized trials. In the United States the majority of patients with GV have underlying portal hypertension rather than splenic vein thrombosis, although exclusion of the latter remains an essential early step in the evaluation. Variceal bleeding is predominantly portal pressure driven rather than dependent on coagulopathy. As a result, reducing portal pressure is the primary objective in managing these patients, along with encouraging the avoidance of over-aggressive volume/procoagulant resuscitation. Intra-gastric balloons (e.g., Sangstaken-Blakemore or Minnesota tubes) can be used to temporize bleeding GV and/or EVs.

Supportive Care

A detailed discussion of the medical management of patients with gastric variceal bleeding is beyond the scope of this literature review. However, it is important to emphasize that patients with gastric variceal bleeding represent a true medical emergency, and require extensive and close (often intensive care unit [ICU]) monitoring and medical attention. Care must be attentive to volume status and resuscitation, pharmacological therapy for portal hypertension, provision of antibiotics per the American Association for the Study of Liver Diseases (AASLD) guidelines urgent or emergent endoscopy and endoscopic treatment when indicated.

Endoscopy

Conventionally, upper endoscopic examination is performed early to evaluate the source of bleeding following hematemesis or melena. Encountering a high-risk GV with recent bleeding or an actively bleeding cardiofundal varix presents the endoscopist with a difficult challenge. Conventional therapeutic approaches using sclerosants or banding are sometimes attempted, although studies have demonstrated a relatively high failure rate for acute control and an early rebleeding rate. A group of researchers reported a comparative trial of sclerotherapy versus banding plus sclerotherapy in acute fundal variceal bleeders. The study was limited by small group size (6 and 11), but it showed a high rebleeding rates in both groups (33% and 45%), which were not statistically significant. This and similar studies demonstrated the significant morbidity associated with such endoscopic techniques and enforced the need for alternative approaches. Endoscopic band ligation for GV has shown more variable results in the control of active bleeding (45% to 93%) and a relatively high (and sometimes catastrophic) rate of rebleeding (44% to 54%). The actuarial 1- and 2-year rebleeding rates of GV after banding were 63% and 72%, respectively.

Cyanoacrylate injection is another endoscopic option resulting in variceal "obturation." Its use emerged in Germany in the 1980s as a hemostatic agent for gastric variceal bleeding. In the past three decades, cyanoacrylate injection has been established as a primary means of achieving gastric varix obliteration in many parts of the world, while its use in the United States continues to be limited. In the meantime, a number of series, including several comparative and randomized controlled trials, have emerged.

In an extended 2-year follow-up, a randomized controlled trial compared cyanoacrylate injection to band ligation, a group of researchers

demonstrated a 27% rebleed rate in the cyanoacrylate group versus 72% rebleeding in the ligation group with no difference in long-term survival. Another randomized controlled trial showed a 1-year rebleeding rate of 15% with cyanoacrylate versus 60% in the band ligation group and a significant survival advantage for the cyanoacrylate group, for the studied period. A cohort study comparing cyanoacrylate to transjugular intrahepatic portosystemic shunt (TIPS) demonstrated rebleeding rates of 30% and 15%, respectively ($P=0.005$). In addition, this study showed similar long-term survival between the groups but with a 50% cost reduction in the cyanoacrylate group. These results were similar from a cost analysis standpoint (comparing TIPS and cyanoacrylate injection) in another study. However, in contrast to the first study, the cohort study did not detect a difference in rebleeding (approximately 15%) or survival at 1 year (approximately 70%) between cyanoacrylate and TIPS, but it did show significantly higher morbidity in the TIPS group, mostly due to hepatic encephalopathy. In a more recent randomly controlled trial of cyanoacrylate versus TIPS with a median follow-up of 33 months, a group of authors reported a higher rebleeding rate from GV in the cyanoacrylate group (38%) compared to the TIPS group (11%), with no difference in survival. Additional endoscopic approaches have been reported, including thrombin injection. Intravariceal injection of thrombin has been shown to be effective in controlling active GV bleeding with a relatively good success rate of 75% to 100% and a low rebleeding rate of 7% to 25%. While cyanoacrylate for managing GV appears somewhat more risky its use remains potentially useful in selected cases, because of the high blood flow through gastric variceal channels, which adds uncertainty to the optimal conditions for cyanoacrylate injection and risks mobilization of the material (possibly causing pulmonary embolism). Overall risk of embolization is estimated at only 1% to 2%, but when it happens it can be severe. Anecdotally, the current authors reserve cyanoacrylate as an option for patients not eligible for balloon-occluded retrograde transvenous obliteration (BRTO) due to vascular anatomy or other conditions.

TIPS and BRTO

From an interventional radiology standpoint there is a controversy regarding the ideal management of GV. In the United States and Europe the primary management is to decompress the portal circulation using TIPS. This is consistent with the long history of decompressive surgeries (surgical portosystemic shunts) that were well established prior to the advent of the TIPS procedure. In Japan and South Korea the primary management is to sclerosing them with the BRTO procedure. This is now changing, and there are at least 10 universities in the United States that perform the BRTO procedure. The spontaneous gastrosplenic/gastrorenal shunt (a portal decompressive shunt) is permanently occluded during the BRTO procedure, and thus there are varying degrees of aggravation of portal hypertension which is contrary to the American decompressive ideology of portal hypertension management.

There are actually limited data in the literature that are specific to TIPS for GV. Most (even more recent studies) amalgamate all varices (esophageal, gastric, or gastroesophageal), and one cannot glean the outcomes specific to patients with GV in these amalgamated studies. On the other hand, BRTO is a procedure that is specific to gastric variceal management, and there are more data showing the efficacy of the procedure (over 40 studies). From this standpoint alone, the TIPS procedure stands at a disadvantage.

There are five studies evaluating TIPS that specifically address patients with portal hypertension complicated by GV. These five studies evaluate a total of 147 patients (range for individual studies: 12 to 35 patients). Two of these studies have intra-institutional comparisons with BRTO outcomes. Two were published before the year 2000 and had a total of 60 patients with actively bleeding GV who had undergone TIPS created by bare stents. In these two studies, the success of TIPS in controlling the active variceal bleeding was 94% (90% to 96%). However, the 6 to 7-month and 12-month rebleeding rates were 26% to 29% and 31%, respectively. The post-TIPS hepatic encephalopathy rate was 16%.

The four studies published in the last decade evaluated a total of 87 patients with GV who underwent a TIPS procedure. However, all the TIPS were created with bare stents. The 12- and 24-month post-TIPS rebleed rates were 11% and 20%, respectively. The primary problem with all five of these studies is that the TIPS were created with bare stents and not stent grafts.

The use of stent grafts would probably make a significant difference considering that TIPS patency has improved from 30% to 69% (bare stents) to 76% to 92% (stent grafts) with the advent of the commercially available stent graft. This is particularly true when considering that over 70% of gastric variceal rebleeding occurrences after TIPS have been associated with TIPS dysfunction (TIPS stenosis or thrombosis).

The two studies that had intra-institutional comparison between BRTO and TIPS had a total of 85 BRTO cases and 40 TIPS cases. Unfortunately, one of the studies had samples (BRTO: 8, TIPS: 13) that were too small for a statistical comparison. The rebleeding and encephalopathy rates for TIPS were 15% and 31%, respectively, and zero in both cases for BRTO. The other more significant study had a larger sample (BRTO: 77, TIPS: 27). The 1-year rebleeding rate for TIPS was 20%, versus 2% for BRTO ($P<0.01$). Furthermore, the 1-, 3-, and 5-year survival rates after BRTO were better than those after TIPS ($P=0.01$): 96%, 83%, 76% versus 81%, 64%, 40%, respectively. However, the improved survival for BRTO compared to TIPS was limited to patients who were classified preprocedurally as Child-Pugh A. There was no difference in survival for patients who were classified as Child-Pugh B or C. Overall, the percentage of patients in both studies who experienced hepatic encephalopathy after TIPS varied between 19% and 31%.

One of the theories about the lower effectiveness of TIPS in reducing the rebleed rate of patients with GVs compared to those with EVs is that there is a higher likelihood of having a diminished portal pressure (<12 mm Hg) in patients with GVs (most likely due to the presence of a

decompressive gastrosplenic/splenoportal shunt). In that setting, the traditional hemodynamic endpoint of the TIPS procedure (reducing the portosystemic gradient to <12 mm Hg) is already in existence. Thus, creating TIPS in these patients to further reduce the portosystemic gradient probably will not have a hemodynamic effect on the gastric variceal system (the GV in addition to the associated decompressive gastrosplenic/splenoportal shunt). Another theory that is complementary to the "low portal pressure theory" is that TIPS has only a limited effect on so-called left-sided portal circulation.

Overall, the technical success rates of BRTO for patients with gastrosplenic/splenoportal shunts and GVs range from 79% to 100% (average: >90% technical success rate). Procedural complications, when mentioned, include gross hematuria (15% to 100% of BRTO cases) with hemoglobinuria-induced renal failure described in up to 4.8% of cases. Pulmonary embolism occurs in 1.5% to 4.1% of cases (symptomatic in 1.4% to 2.5% of cases). Anaphylaxis to ethanolamine oleate (up to 5%), cardiac arrhythmias (up to 1.5%), and rapidly declining hepatic function (up to 5% to 7%) have also been described. The 30-day mortality rates range from zero to 4.1%, and the most common cause of death is progressive hepatic failure.

The aggravation of nongastric (esophageal or duodenal) varices appears to be a major problem in the long run and is reflective of increasing portal hypertension following BRTO. It varies widely, probably depending on the degree of pre-BRTO prophylactic banding and the post-BRTO vigilance, documentation, and thoroughness of follow-up endoscopy. However, in four studies evaluating 160 patients who had undergone BRTO and had continuous endoscopic follow-up post-BRTO, the esophageal variceal aggravation rates (expressed as a Kaplan-Meier analysis) at 1, 2, and 3 years were: 27% to 35%, 45% to 66%, and 45% to 91%, respectively. In another two studies evaluating 117 patients with BRTO, the percentage of patients with aggravated EV was 30% to 68%, and the percentage of patients who had bleeding EV was 17% to 24% (36% to 57% of those with aggravated EV went on to have bleeding). Again, one can argue that the percentage of esophageal variceal bleeding may be significantly reduced by greater vigilance with endoscopic follow-up and more aggressive endoscopic therapy (esophageal banding and/or sclerotherapy). Other complications reflective of increased portal hypertension following BRTO include the development of portal hypertensive gastropathy (occurs in 5% to 13%), ascites (occurs in 0% to 44%), and hydrothorax/pleural effusion (occurs in 0% to 8%).

The rebleeding rate following BRTO depends on how it is presented. In most studies, gastric variceal rebleed rates of patients who had undergone a successful BRTO procedure range between zero and 20% (all studies except one had a gastric rebleed rates under 10%). However, when factoring in an intent-to-treat basis for the results, the gastric variceal rebleed rates are zero to 31.6%. Many studies do not clearly state what, if any, is the global rebleed rate from gastric, esophageal, duodenal varices, or as portal hypertensive gastropathy. In three clearly reported studies evaluating a total of 141 patients who had undergone a BRTO procedure, the gastric variceal rebleed rate of successful BRTO procedures, the intent to treat gastric variceal rebleed rate, and the global (all types of varices) variceal rebleed rates were: 3.2% to 8.7%, 10% to 20%, and 19% to 31%, respectively. Conceptually and to provide some perspective, these results can be compared to the latest four studies evaluating a total of 87 patients who underwent a TIPS procedure for GV bleeding and who had a 12 to 24 month global rebleed rate of 11% to 20%. This highlights the importance of subsequent surveillance endoscopy in either approach to GV, but particularly following BRTO.

BRTO of GV involves the transvenous sclerosis of GV via a spontaneous gastrosplenic shunt. A consequence of the BRTO procedure is the occlusion (sclerosis) of this spontaneous gastrosplenic shunt. TIPS is known to increase the Model for End Stage Liver Disease (MELD) score because the newly established shunt diverts blood flow away from the liver. Conversely, BRTO is closure of a spontaneous hepatofugal shunt, potentially diverting blood flow towards the liver. However, BRTO has been known to sometimes aggravate splenomegaly, EV, ascites, and hydrothorax as discussed above. On the other hand, it is controversial whether the Child-Pugh score remains unchanged or improves after BRTO. However, the majority of authors conclude that if the Child-Pugh score improves initially in the first 6 to 9 months after BRTO, it then returns to pre-BRTO baseline levels. Thus, BRTO (unlike TIPS) preserves hepatic function in the long term. Thus the greatest advantage of BRTO over TIPS is its preservation of hepatic function and its reduction in the risk of hepatic encephalopathy. In fact, one of the emerging indications for BRTO is encephalopathy with the presence of a gastrosplenic or gastrosplenoportal shunt. In five studies evaluating a total of 35 patients with encephalopathy there was resolution or significant reduction in encephalopathy in all patients. Moreover, the actuarial survival rate after BRTO is impressive. The 1-, 2-, 3-, and 5-year survival rates range from 83% to 98%, 76% to 79%, 66% to 85%, and 39% to 69%, respectively. Obviously, the greatest determinant of survival is the patient's hepatic reserve.

Summary

- The ideal management of gastric varices is largely uncharted and requires a multidisciplinary approach.
- Patients with bleeding gastric varices have numerous variability in baseline stability, baseline liver reserve and other associated morbidities; and their management should be multidisciplinary and on a case-by-case basis.
- Institutions with unique experience and teams (interventional and gastrointestinal) with particular procedural skill sets are required to provide the full scope of available procedures.
- Procedural techniques that can be used, individually or concomitantly, for the management of gastric varices include: endoscopic banding and glue injection, TIPS creation or BRTO.

- BRTO is an effective procedure for the management of gastric varices and is a viable alternative to TIPS in unique clinical and anatomical settings.

Abbreviations

- BRTO, balloon-occluded retrograde transvenous obliteration
- CT, computed tomography
- MELD, Model for End Stage Liver Disease
- MRI, magnetic resonance imaging
- TIPS, transjugular intrahepatic portosystemic shunt

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Gastric varices

Guideline Category

Management

Treatment

Clinical Specialty

Emergency Medicine

Gastroenterology

Internal Medicine

Radiology

Intended Users

Emergency Medical Technicians/Paramedics

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of radiologic treatment procedures for management of gastric varices

Target Population

Patients with gastric varices

Interventions and Practices Considered

1. Transjugular intrahepatic portosystemic shunt (TIPS)
2. Balloon-occluded retrograde transvenous obliteration (BRTO)
3. Endoscopic management (sclerosis or cyanoacrylate injection)

Major Outcomes Considered

- Survival
- Control of active bleeding
- Rebleeding rates
- Hepatic encephalopathy rate
- Rate of procedural complications

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to

three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A cohort study comparing cyanoacrylate to transjugular intrahepatic portosystemic shunt (TIPS) showed similar long-term survival between the groups but with a 50% cost reduction in the cyanoacrylate group.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic treatment procedures for management of gastric varices

Potential Harms

- Overall risk of embolization with cyanoacrylate injection is estimated at only 1% to 2%, but when it happens it can be severe.
- Procedural complications of balloon-occluded retrograde transvenous obliteration (BRTO) include gross hematuria (15% to 100% of cases) with hemoglobinuria-induced renal failure described in up to 4.8% of cases. Pulmonary embolism occurs in 1.5% to 4.1% of cases (symptomatic in 1.4% to 2.5% of cases). Anaphylaxis to ethanolamine oleate (up to 5%), cardiac arrhythmias (up to 1.5%), and rapidly declining hepatic function (up to 5% to 7%) have also been described. The 30-day mortality rates range from zero to 4.1%, and the most common cause of death is progressive hepatic failure.
- The aggravation of nongastric (esophageal or duodenal) varices appears to be a major problem in the long run and is reflective of increasing portal hypertension following BRTO. Other complications reflective of increased portal hypertension following BRTO include the development of portal hypertensive gastropathy (occurs in 5% to 13%), ascites (occurs in 0% to 44%), and hydrothorax/pleural effusion (occurs in 0% to 8%).

- The bleeding and encephalopathy rates for transjugular intrahepatic portosystemic shunt (TIPS) were 15% and 31%, respectively, and zero in both cases for BRTO.

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Saad, WEA, Al-Osaimi AM, Caldwell S, Ray CE Jr, Lorenz JM, Burke CT, Darcy MD, Fidelman N, Greene FL, Hohenwarter EJ, Kinney TB, Kolbeck KJ, Kostselic JK, Kouri BE, Nair AV, Rochon PJ, Rockey DC, Vatakencherry G, Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of gastric varices. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 8 p. [84 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2012

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Interventional Radiology

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#) .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013

Nov. 3 p. Electronic copies: Available in PDF from the [ACR Web site](#) .

- ACR Appropriateness Criteria®. Evidence table development – therapeutic studies. Reston (VA): American College of Radiology; 2013
Nov. 4 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria® radiologic management of gastric varices. Evidence table. Reston (VA): American College of Radiology; 40 p. Electronic copies: Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

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